NCNR VIRTUAL SEMINAR

Terahertz Magnetospectroscopy Evidence of Spin-Magnon Interactions in the Low-Temperature Phase Transition of Erbium Orthoferrites

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Cooperative effects that arise from the interaction between N two-level atoms and a single mode of light can be successfully explained by the celebrated Dicke Hamiltonian, one of the most fundamental models in quantum optics. Extensive research has been carried out over the years to understand some of its far-reaching consequences, particularly, the possibility of a second-order phase transition known as the superradiant phase transition (SRPT), when the light-matter coupling strength exceeds a critical value. To date, a SRPT in thermal equilibrium has not been realized, and it has been shown that charged particles interacting with an electromagnetic field will remain stable against it. For magnetic materials, where spins instead of charges interact with a common quantum field, however, there remains a strong possibility to observe a phase transition analogous to the SRPT. Here, we have studied the low temperature properties of the rare-earth orthoferrite Er_{1-x}Y_{x}FeO_{3} using terahertz (THz) time-domain magnetospectroscopy. We found that the phase transition that this material exhibits can be modeled using an extended Dicke Hamiltonian that incorporates short-range Er-Er exchange interactions.

Friday, December 11, 2020
10:45 am | (UTC-05:00) Eastern Time (US & Canada) | 1 hr

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